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REMARKS

*Specification*

The Specification paragraph [0044] on page 7 of the Substitute Specification, has been amended based on Specification FIG. 4 as follows:

"A first pinned layer 122 is above the tunneling barrier layer 120 and is a ferromagnetic material such as cobalt (Co), iron (Fe), cobalt iron (CoFe), nickel iron (NiFe), or cobalt nickel iron (CoNiFe). The first pinned layer 122 also overhangs the hard magnet 114."

The support for this amendment is in Specification FIG. 4, which shows that the first pinned layer 122 overhangs the hard magnet 114. This amendment introduces no new matter based on *In re Wofensperger*, 302 F.2d 950, 133 USPQ 537 (CCPA 1962), which holds that drawings alone may provide the basis for subsequent amendments to the specification without producing prohibitory new matter.

*Claim Rejections - 35 USC §102*

**Claims 1, 11, 13, and 15 are rejected under 35 USC §102(e) as being anticipated by Redon et al (USPN 6,381,107, hereinafter "Redon").**

Summary of Redon:

Redon provides a common lead and shield layer to be electrically contacted with a tunnel multilayered film for supplying a sense current to the tunnel multilayered film. The common lead and shield layer extends to a rear portion of the tunnel multilayered film from an ABS (Air Bearing Surface) so that a part of the common lead and shield layer located at the rear portion of the tunnel multilayered film serves as a back flux guide for improving a read output with an improved biasing efficiency. FIG. 1 shows: a biasing hard magnet 61 with an opening D+Lp+D; a free layer 20; a tunnel barrier layer 30; a pinned layer 40 over the opening and not overhanging the opening; and a pinning layer 50.

Summary of Invention:

A hard biased spin-dependent tunneling sensor and manufacturing method therefor is provided having a substrate with a first lead formed thereon. A hard magnet is formed over

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the first lead and a free layer is formed over the hard magnet. A tunneling barrier layer with a first pinned layer formed thereon is formed over the free layer. A nonmagnetic coupling layer with a second pinned layer formed thereon is formed over the first pinned layer. A pinning layer is formed over the second pinned layer and a second lead is formed over the pinning layer. FIG. 4 shows: a biasing hard magnet 114 having an opening; a free layer 118; a barrier layer 120; a first pinned layer 122 overhanging the opening; a nonmagnetic coupling layer 124; a second pinned layer 126; a pinning layer 128; and a gap spacer 130.

With regard to claims 1 and 11, these independent claims have been clarified to amend the previously claimed combination, as exemplified in claim 1, to now include the limitation that:

"forming a first pinned layer over the hard magnet and overhanging the hard magnet;" [underlining for clarity]

The support for this amendment is in Specification FIG. 4 and page 7, para. [0044].

The phrase "and overhanging the hard magnet" has been deleted from claim 1 in the first occurrence in line 4, because it was inserted there in error in the Amendment submitted June 4, 2004, and confuses the arguments.

The claim limitation clearly distinguishes from Redon, which specifically discloses the parameter for a non-overhang space "D" in Redon col. 6, lines 44-65

"Each of the biasing means 61 and 61 is formed such that a predetermined space D is maintained from the corresponding longitudinal end of the ferromagnetic pinned layer 40, as shown in FIG. 1."

The space D is preferably determined, upon determining the head specification, in a predetermined range in order to avoid substantial lowering of TMR ratio characteristics. It is preferable that the specific value is set depending on the head specification, such as materials and dimensions of components to be used. As a preferred example, the space D is set to be no less than 0.02  $\mu$ m, particularly in the range of 0.02  $\mu$ m to 0.3  $\mu$ m, and more preferably, in the range of 0.02  $\mu$ m to less than 0.15  $\mu$ m. If the value of D is less than 0.02  $\mu$ m, the TMR ratio tends to be lowered. In contrast, if the value of D increases to exceed 0.3  $\mu$ m, an effective track width is unfavorably expanded to result in failure to meet with the requirement of high density recording in the future. If a concentrated attention is paid to the effective track width, the D value is preferably set to be in the range of no less than 0.02  $\mu$ m to less than 0.15  $\mu$ m." [underlining for clarity]

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In Redon, the space D is required, and careful control of the space D is absolutely essential for operation.

The claim limitation, by virtue of the overhang of the first pinned layer over the hard magnet, eliminates the need for the space D or control of the space D and now clearly distinguishes from Redon and any obvious modification thereof.

Similar amendments have been made to the apparatus claim 11, which distinguishes from Redon for the same reasons as provided for in method claim 1.

With regard to claims 13 and 15, these dependent claims depend from now amended independent claim 11 and are believed to be allowable since they contain all the limitations set forth in the independent claim from which they depend and claim additional unobvious combinations thereof.

It is respectfully submitted that the now amended independent claims 1 and 11, and the respective claims 13 and 15 depending therefrom, are not anticipated by Redon under 35 USC §102.

*Claim Rejections - 35 USC §103*

Claims 2, 6, 7, 12, 16-18 and 20 are rejected under 35 USC §103(a) as being unpatentable over Redon et al (USPN 6,381,107, hereinafter "Redon").

Redon has been summarized above.

The present invention has also been summarized above.

With regard to claims 2 and 12, these dependent claims respectively depend from independent claim 1 and are believed to be allowable since they contain all the limitations set forth in the independent claim from which they depend and claim additional unobvious combinations thereof. Claims 2 and 12 are not obvious over Redon not only because Redon fails to teach or suggest a pinned layer overhanging a hard magnet, but also because Redon

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teaches away from such a structure and emphatically teaches the need for non-overhanging space D, as explained in Redon col. 6, lines 51-52:

“...in order to avoid substantial lowering of TMR ratio characteristics.”

More specifically, Redon col. 6, lines 55-56, teaches that there cannot be an overhang because the Redon space D has a minimum value:

“...the space D is set to be no less than 0.02  $\mu\text{m}$ ,...”

Thus, Redon teaches away from the invention of claims 2 and 12.

With regard to claims 6 and 16, these independent claims have been clarified to amend the previously claimed combination, as exemplified in claim 6, to now include the limitation that:

“forming over the tunneling barrier layer and overhanging the hard magnet, a first pinned layer containing a material selected from a group consisting of cobalt, iron, nickel, and a combination thereof;” [underlining for clarity]

The support for this amendment is in the Specification FIG. 4 as explained in the amendments to the Specification above.

As explained for claims 2 and 12 above, it is respectfully submitted that Redon teaches away from forming a free layer overhanging a free magnet in Redon col. 6, lines 51-52 and 55-56, *supra*. This teaching away further appears in the range set in Redon col. 6, lines 63-65. In addition, Redon col. 6, lines 51-52, suggests that reducing the space D to zero would lower the TMR ratio characteristics until the Redon device would be inoperative.

The phrase “and overhanging the hard magnet” has been deleted from claim 6 in the first occurrences in line 8, because it was inserted there in error in the Amendment submitted June 4, 2004, and confuses the arguments.

Similar amendments have been made to the apparatus claim 16, which is unobvious from Redon for the same reasons as provided for method claim 6.

Based on the above, it is respectfully submitted that claims 6 and 16 are allowable under 35 USC §103(a) as being patentable over Redon because the CAFC has stated:

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"We have noted elsewhere, as a "useful general rule," that references that teach away cannot serve to create a *prima facie* case of obviousness." *In re Gordon*, 733 F.2d 900, 902, 221 USPQ 1125, 1127 (Fed. Cir. 1984)[deletion for clarity]

With regard to claims 7, 17, 18, and 20, these dependent claims depend from independent claims 6 and 16, and are believed to be allowable since they contain all the limitations set forth in the independent claim from which they depend and claim additional unobvious combinations thereof.

Based on the above, it is respectively submitted that claims 2, 6, 7, 12, 16-18 and 20 are allowable under 35 USC §103(a) as being unobvious over Redon and any obvious modification thereof.

**Claims 3, 5, 8, and 10 are rejected under 35 USC §103(a) as being unpatentable over Redon et al (USPN 6,381,107, hereinafter "Redon") in view of Khan et al (USPN 6,495,311, hereinafter "Khan").**

Redon has been summarized above.

Khan provides a magnetic tape recording head formed with magnetic poles that are comprised of a laminated NiFeN/FeN structure. The method for fabricating the magnetic poles utilizes an additive photolithographic technique including a bilayer liftoff resist. In this fabrication method magnetic pole trenches are formed in the bilayer liftoff resist such that an undercut exists in the liftoff layer. Thereafter, the laminated NiFeN/FeN structure is sputter deposited into the trench, followed by the wet chemical removal of the bilayer resist.

With regard to claims 3, 5, 8, and 10, these dependent claims depend from independent claim 1 and are believed to be allowable since they contain all the limitations set forth in the independent claim from which they depend and claim additional unobvious combinations thereof. Further, no motivation has been shown in either reference for the combination, and in *In re Sang-Su Lee*, 277 F.3d 1338, 61 USPQ2d 1430 (Fed. Cir. 2002), the Court held that the conclusion of obviousness may not be made from common knowledge

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and common sense of a person of ordinary skill in the art without any specific hint or suggestion in a particular reference.

Based on the above, it is respectfully submitted that claims 3, 5, 8, and 10 are allowable under 35 USC §103(a) as being unobvious over Redon in view of Khan.

**Claims 14 and 19 are rejected under 35 USC §103(a) as being unpatentable over Redon et al (USPN 6,381,107, hereinafter "Redon") in view of Fukuzawa et al (USPN 6,146,776, hereinafter "Fukuzawa").**

Redon has been summarized above.

Fukuzawa discloses a spin valve GMR film, which has a free layer containing a Co containing magnetic layer, and a hard magnetic biasing film for inputting a bias magnetic field to the spin valve GMR film. The hard magnetic biasing film is constituted of a film formed by laminating a hard magnetic layer on the magnetic under layer. The hard magnetic layer is disposed adjoining to edge portion of the spin valve GMR film through the magnetic under layer. The magnetic under layer has saturation magnetization  $M_s^{under}$  which satisfies at least one condition of  $M_s^{under}$  greater or equal to  $M_s^{free}$  and  $M_s^{under}$  greater or equal to  $M_s^{hard}$  when saturation magnetization of the free layer is  $M_s^{free}$  and saturation magnetization of the hard magnetic layer is  $M_s^{hard}$ . In a MR head of this abutted junction structure, even when the track width is narrowed, occurrence of Barkhausen noise can be effectively suppressed. [mathematical symbols replaced by verbiage]

With regard to claims 14 and 19, these dependent claims depend from independent claims 11 and 16 and are believed to be allowable since they contain all the limitations set forth in the independent claim from which they depend and claim additional unobvious combinations thereof. Further, no motivation has been shown in either reference for the combination, and in *In re Sang-Su Lee*, supra., the Court held that the conclusion of obviousness may not be made from common knowledge and common sense of a person of ordinary skill in the art without any specific hint or suggestion in a particular reference.

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Based on the above, it is respectfully submitted that claims 14 and 19 are allowable under 35 USC §103(a) as being unobvious over Redon in view of Fukuzawa.

**Claims 4 and 9 are rejected under 35 USC §103(a) as being unpatentable over Redon et al (USPN 6,381,107, hereinafter "Redon") in view of Khan et al (USPN 6,495,311, hereinafter "Khan") and Fukuzawa et al (USPN 6,146,776, hereinafter "Fukuzawa").**

Redon, Khan, and Fukuzawa have been summarized above.

With regard to claims 4 and 9, these dependent claims depend from independent claims 1 and 6, and are believed to be allowable since they contain all the limitations set forth in the independent claim from which they depend and claim additional unobvious combinations thereof. Further, no motivation has been shown in any of the references for the combination, and in *In re Sang-Su Lee*, supra., the Court held that the conclusion of obviousness may not be made from common knowledge and common sense of a person of ordinary skill in the art without any specific hint or suggestion in a particular reference.

Based on the above, it is respectfully submitted that claims 4 and 9 are allowable under 35 USC §103(a) as being unobvious over Redon in view of Khan and Fukuzawa.

The other references cited by the Examiner showing the prior art have been considered and are not believed to disclose, teach, or suggest, either singularly or in combination, Applicants' invention as now amended.

#### *Conclusion*

In view of the above, it is submitted that the claims are in condition for allowance and reconsideration of the rejections is respectfully requested. Allowance of claims 1-20 at an early date is solicited.

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To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including any extension of time fees, to Deposit Account No. 50-0374 and please credit any excess fees to such deposit account.

Respectfully submitted,



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Date: October 23, 2004